



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,467	09/08/2003	Hiroyuki Okuyama	112857-431	9821
29175	7590	06/16/2005	EXAMINER	
BELL, BOYD & LLOYD, LLC P. O. BOX 1135 CHICAGO, IL 60690-1135			LEWIS, MONICA	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 06/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/657,467

Applicant(s)

OKUYAMA ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 1-15, 23, 25 and 27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16-22, 24, 26 and 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This office action is in response to the election filed April 25, 2005.

#### ***Election/Restrictions***

2. Applicant's election without traverse of Group I in the reply filed on 4/25/05 is acknowledged.

#### ***Specification***

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 18 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 18, Applicant discloses "a nitride oxide based III-V compound semiconductor." Additionally in claim 19, Applicant discloses "a semiconductor layer of the second conductive type includes a nitride oxide based III-V compound semiconductor." However, the materials disclosed in the specification which are examples of nitride oxide based III-V compound semiconductors do not include nitride and oxide (See Page 4 Lines 21-30). All

Art Unit: 2822

of the materials that are disclosed are nitrogen containing III-V compound semiconductors.

There are no materials including oxygen.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 16-21, 24, 26 and 28, as far as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Okuyama et al. (U.S. Patent No. 6,881,982) in view of Sawaki et al. (U.S. Publication No. 2002/0074561).

In regards to claim 16, Okuyama et al. ("Okuyama") discloses the following:

a) a semiconductor layer (34) of a first conductive type formed on a principal plane of a substrate, the semiconductor layer including a raised crystal portion having tilt crystal planes tilted from the principal plane (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

b) at least an active layer (35) and a semiconductor layer (36) of a second conductive type wherein, the active layer and the semiconductor are sequentially stacked at least on the tilt crystal planes of the raised crystal portion (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

c) a first electrode (39) electrically connected to the semiconductor layer of the first conductive type (For Example: See Column 14 Lines 48-53); and

d) a second electrode (37) electrically connected to the semiconductor layer of the second conductive type wherein, the second electrode are provided on the semiconductor layer of the second conductive type on the raised crystal portion (For Example: See Figure 5B).

In regards to claim 16, Okuyama fails to disclose the following:

a) a size of the second electrode is in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked.

Art Unit: 2822

However, Sawaki et al. ("Sawaki") discloses a semiconductor device where the size of the second electrode (16) is in a range of about 50% or less of a size of the raised crystal portion (5) on which the active layer and the semiconductor layer of the second conductive type have been stacked (For Example: See Figure 2, Paragraph 45 and Paragraph 57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Okuyama to include a second electrode in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked as disclosed in Sawaki because it aids in improving the photoelectric property of the device (For Example: See Paragraph 11).

Additionally, since Okuyama and Sawaki are both from the same field of endeavor, the purpose disclosed by Sawaki would have been recognized in the pertinent art of Okuyama.

In regards to claim 17, Okuyama discloses the following:

a) the raised crystal portion has a wurzite type crystal structure (For Example: See Column 5 Lines 25 and 26).

In regards to claim 18, Okuyama discloses the following:

a) the raised crystal portion includes a nitride oxide based III-V compound semiconductor (For Example: See Column 6 Lines 8-12) (Note: The reference discloses the same materials as Applicant's, i.e., nitride based III-V compound semiconductors).

In regards to claim 19, Okuyama discloses the following:

a) the semiconductor layer of the first conductive type, the active layer, and the semiconductor layer of the second conductive type includes a nitride oxide based III-V compound semiconductor (For Example: See Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6) (Note: The reference discloses the same materials as Applicant's, i.e., nitride based III-V compound semiconductors).

Art Unit: 2822

In regards to claim 20, Okuyama discloses the following:

a) the tilt crystal planes includes S-planes (For Example: See Column 14 Lines 6-8).

In regards to claim 21, Okuyama discloses the following:

a) the raised crystal portion is formed into a hexagonal pyramid shape having S-planes as the tilt crystal planes (For Example: See Column 5 Lines 53-57).

In regards to claim 24, Okuyama discloses the following:

a) a semiconductor layer (34) of a first conductive type formed on a principal plane of a substrate, the semiconductor layer including a raised crystal portion having tilt crystal planes tilted from the principal plane (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

b) at least an active layer (35) and a semiconductor layer (36) of a second conductive type wherein, the active layer and the semiconductor are sequentially stacked at least on the tilt crystal planes of the raised crystal portion (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

c) a first electrode (39) electrically connected to the semiconductor layer of the first conductive type (For Example: See Column 14 Lines 48-53); and

d) a second electrode (37) electrically connected to the semiconductor layer of the second conductive type wherein, the second electrode are provided on the semiconductor layer of the second conductive type on the raised crystal portion (For Example: See Figure 5B).

In regards to claim 24, Okuyama fails to disclose the following:

a) a size of the second electrode is in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked.

However, Sawaki discloses a semiconductor device where the size of the second electrode (16) is in a range of about 50% or less of a size of the raised crystal portion (5) on which the active layer and the semiconductor layer of the second conductive type have been stacked (For Example: See Figure 2, Paragraph 45 and Paragraph 57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the

Art Unit: 2822

semiconductor of Okuyama to include a second electrode in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked as disclosed in Sawaki because it aids in improving the photoelectric property of the device (For Example: See Paragraph 11).

Additionally, since Okuyama and Sawaki are both from the same field of endeavor, the purpose disclosed by Sawaki would have been recognized in the pertinent art of Okuyama.

In regards to claim 26, Okuyama discloses the following:

a) a semiconductor layer (34) of a first conductive type formed on a principal plane of a substrate, the semiconductor layer including a raised crystal portion having tilt crystal planes tilted from the principal plane (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

b) at least an active layer (35) and a semiconductor layer (36) of a second conductive type wherein, the active layer and the semiconductor are sequentially stacked at least on the tilt crystal planes of the raised crystal portion (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

c) a first electrode (39) electrically connected to the semiconductor layer of the first conductive type (For Example: See Column 14 Lines 48-53); and

d) a second electrode (37) electrically connected to the semiconductor layer of the second conductive type wherein, the second electrode are provided on the semiconductor layer of the second conductive type on the raised crystal portion (For Example: See Figure 5B).

In regards to claim 26, Okuyama fails to disclose the following:

a) a size of the second electrode is in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked.

However, Sawaki discloses a semiconductor device where the size of the second electrode (16) is in a range of about 50% or less of a size of the raised crystal portion (5) on which the active layer and the semiconductor layer of the second conductive type have been stacked (For Example: See Figure 2, Paragraph 45 and Paragraph 57). It would have been

Art Unit: 2822

obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Okuyama to include a second electrode in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked as disclosed in Sawaki because it aids in improving the photoelectric property of the device (For Example: See Paragraph 11).

Additionally, since Okuyama and Sawaki are both from the same field of endeavor, the purpose disclosed by Sawaki would have been recognized in the pertinent art of Okuyama.

In regards to claim 28, Okuyama discloses the following:

a) a semiconductor layer (34) of a first conductive type formed on a principal plane of a substrate, the semiconductor layer including a raised crystal portion having tilt crystal planes tilted from the principal plane (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

b) at least an active layer (35) and a semiconductor layer (36) of a second conductive type wherein, the active layer and the semiconductor are sequentially stacked at least on the tilt crystal planes of the raised crystal portion (For Example: See Figure 5A, Figure 5B, Figure 6, Column 13 Lines 52 and 63-67 and Column 14 Lines 1-6);

c) a first electrode (39) electrically connected to the semiconductor layer of the first conductive type (For Example: See Column 14 Lines 48-53); and

d) a second electrode (37) electrically connected to the semiconductor layer of the second conductive type wherein, the second electrode are provided on the semiconductor layer of the second conductive type on the raised crystal portion (For Example: See Figure 5B).

In regards to claim 28, Okuyama fails to disclose the following:

a) a size of the second electrode is in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked.

However, Sawaki discloses a semiconductor device where the size of the second electrode (16) is in a range of about 50% or less of a size of the raised crystal portion (5) on which the active layer and the semiconductor layer of the second conductive type have been



Art Unit: 2822

stacked (For Example: See Figure 2, Paragraph 45 and Paragraph 57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Okuyama to include a second electrode in a range of about 50% or less of a size of the raised crystal portion on which the active layer and the semiconductor layer of the second conductive type have been stacked as disclosed in Sawaki because it aids in improving the photoelectric property of the device (For Example: See Paragraph 11).

Additionally, since Okuyama and Sawaki are both from the same field of endeavor, the purpose disclosed by Sawaki would have been recognized in the pertinent art of Okuyama.

9. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuyama et al. (U.S. Patent No. 6,881,982) in view of Sawaki et al. (U.S. Publication No. 2002/0074561) and Oohata et al. (U.S. Publication No. 2003/0087467).

In regards to claim 22, Okuyama fails to disclose the following:

a) the raised crystal portion is formed into a hexagonal truncated pyramid shape having S-planes as the tilt crystal planes and a C-plane as an upper plane.

However, Oohata et al. ("Oohata") discloses a semiconductor device that has a raised crystal portion that is formed into a hexagonal truncated pyramid shape having S-planes as the tilt crystal planes and a C-plane as an upper plane (For Example: See Paragraph 45). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Okuyama to include a raised crystal portion that is formed into a hexagonal truncated pyramid shape having S-planes as disclosed in Oohata because it aids in providing enhanced light emergence efficiency (For Example: See Paragraph 10).

Additionally, since Okuyama and Oohata are both from the same field of endeavor, the purpose disclosed by Oohata would have been recognized in the pertinent art of Okuyama.

Art Unit: 2822


***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956

ML

June 11, 2005

  
2822